



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Courtney J. Shipp	Project Number J0226
Project Title Maximizing the Trajectory of a Trebuchet	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this project is to determine the relationship between several variables of a trebuchet and the distance it is able to throw a projectile. These variables include the length of the counterweight arm, the length of the throwing arm and the length of the sling. It was hypothesized that if the counterweight arm, throwing arm, and sling were lengthened, then the trajectory would be maximized and the trebuchet would throw the projectile farther.</p> <p>Methods/Materials A trebuchet is a siege weapon that was used in Europe during the Middle Ages before gunpowder was invented. To run this experiment, a model trebuchet was built using PVC and a golf ball was launched fifteen times with each of the following variables: counterweight arms with lengths of 4, 5, 6, 7, 8 and 9 inches; throwing arms with lengths of 16, 18, 20, 22, and 24 inches and slings with lengths of 16, 18, 20, 22, and 24 inches.</p> <p>Results The 6 inch counterweight arm, 20 inch throwing arm and 20 inch sling combination maximized the trajectory and produced the longest throws, with the distances declining as the counterweight arm, throwing arm, or sling were shortened or lengthened.</p> <p>Conclusions/Discussion These parameters were optimal because at this setting the trebuchet was releasing the golf ball at an ideal angle after the golf ball had received the maximum amount of energy the trebuchet could transfer to it. With other combinations of the variables, the trebuchet would release the golf ball either too early or too late. This affected the amount of energy transferred to the golf ball. When the trebuchet released the golf ball too late, energy was lost in the release from the sling. When the ball was released too early, it had not received all the energy the trebuchet had to transfer. Therefore, the results did not support the hypothesis.</p>	
Summary Statement This project tested a trebuchet by varying the length of the counterweight arm, throwing arm and sling to determine which combination would maximize the trajectory of a golf ball launched from the trebuchet.	
Help Received My family helped me to run experiments and collect data accurately, my dad helped me glue the trebuchet together, and my mom helped me arrange my board.	